

## Drop in the Bucket (WET 238)

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Investigate the percentage of available fresh water on Earth. Discuss and explore the implications of their findings, students understand that this resource is limited so must be conserved and managed sustainably, on personal, local and global scales.

### Materials:

- |                             |                                      |
|-----------------------------|--------------------------------------|
| » water                     | » dropper or glass stirring rod      |
| » globe and /or world map   | » food dye                           |
| » 1000 ml beaker / cylinder | » salt                               |
| » 100 ml graduated beaker   | » small bucket                       |
| » small dish or beaker      | » copies of Water Availability table |

### Method: Discussion points in italics

Fill 1000ml container. Color with a few drops of food dye so it is easier to see.

*This represents all the water on Earth.*

*Where is most of this water is located? Estimate the amount of salt water on Earth's?*

Pour 30 ml from the 1000 ml into the graduated beaker - this represents the 3% of Earth's fresh water. Salt the remaining 97% to simulate ocean water, unsuitable for consumption.

*Consider the 30ml remaining. In what state is this remaining 3%?*

*What is found at the Earth's poles? Estimate how much water is frozen at the Poles?*

Pour 6ml of the fresh water into the small dish or beaker. The remaining 24ml place in a freezer or frig, or otherwise simulate ice, eg. pour into an ice cube tray.

*80% of the Earth's fresh water is frozen in ice caps and glaciers! The amount of water in the small container (0.6% of the original amount) represents non-frozen fresh water. Only about 1/4 of this is surface water; the rest (3/4) is underground.*

Use a dropper to release a single drop of water into a small metal bucket so students can listen for the "drop".

*This represents clean, fresh water that is not polluted or otherwise unavailable for use - about 0.003% of the total. This precious drop must be managed with care.*

From this demonstration, many of you may conclude that there is only a very small amount of water available for humans. In fact, on a global scale the single drop actually represents a large volume of water.

**Background.** Water covers 3/4 of Earth's total surface but less than half of one percent is available fresh water. An estimated 97% is seawater, another 2% is locked in polar icecaps and glaciers, and the rest of the unavailable water is trapped deep below the earth's surface.

**Available fresh water comes from many sources:** rivers, streams, and lakes; groundwater - aquifers; collected rainwater; and purified seawater.

#### Discussion:

- » Why does more than one-third of the world's population not have access to clean water? Discuss global distribution of water.
- » Investigate the factors affecting water distribution on Earth (land forms, vegetation, proximity to large areas of water, role of oceans, etc). Have class work in small groups and report back to share their findings.
- » Explore other environmental and natural influences on the availability of water (droughts, floods, pollution, etc). Research current events, conditions and activities affecting the availability of water, - locally, and elsewhere in the world.
- » Discuss long term events, activities and behaviors which will reduce the amount of fresh, potable water available for human consumption. Consider at a local and global scale. Consider other users of water, apart from humans.

**Action.** Can you identify our town's major water supply (aqueduct, reservoir, dam, river)? How many gallons per day does the population need? What is the town's major industry and how does it use water? Does Carson City/ Reno have an emergency water supply in case of a drought or well contamination?

Use the Water Availability table to calculate the actual amount of fresh water available per person.

#### Water Availability Table:

Quantity to be divided among people on Earth	Amount Available litres per person	% of total water
All the water on Earth	222 billion	100%
Only the fresh water(calculate 3% of the amount available		3%
Only the non-frozen fresh water(calculate 20% of the remaining amount available)		0.6%
Available fresh water that is not polluted, trapped in soil, too far below the ground, etc.(calculate 0.5% of the remaining amount available)		0.003%

1. Is this enough? Devise a means to estimate how much water you use per year. Compare the estimate to the calculation above. What do you conclude?
2. List the other uses of water that affect you, but are not a direct result of your actions. Does this alter your conclusion? Why?

Answer Key:

Water Availability table based on a global population of 6.3 billion

Quantity to be divided among people on Earth	Amount Available litres per person	% of total water
All the water on Earth	222 billion	100%
Only the fresh water	6.6 billion	3%
Only the non-frozen fresh water	1.3 billion	0.6%
Available fresh water that is not polluted, trapped in soil, too far below the ground, etc.	6.5 million	0.003%

**Deeper Depths.** To help explore some of the issues concerning water and water rights, have students discuss facts as a panel. Designate two groups as city government or water officials. Designate others as various water users - residential, commercial, agriculture, and industrial.

Discuss certain issues (drought, new business coming in, new dam upstream, local habitat loss) that require reallocation of water from supplies.